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Animal Keepers' Forum

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American Association of Zoo Keepers, Inc.

The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

ABOUT THE COVER

This month's cover photo comes to us from Janet Miner of the Elmwood Park Zoo. The photo features "Inka", the Jaguar (*Panthera onca*) whose story of recovery from an ischemic stroke can be found on pages 102-106.

Jaguars are the largest cats in the Americas. Adults weigh on average 80-250 pounds, although there have been records of males weighing 347 pounds. They measure about 30 inches at the shoulder and about six feet long plus a 30-inch tail. The coat is a tawny-yellow with spots on the head, neck and legs and rosettes on the rest of the body. Both the jaguar and leopard are known to have melanistic, or black, individuals. These individuals also have the spots and rosettes which are more visible in bright light. It has been said that the jaguar is the only big cat that does not roar, but the jaguar has an array of vocalizations including mews, grunts and a deep, repetitive "coughing" chuff.

The International Union for the Conservation of Nature (IUCN) lists jaguars as "near threatened." Several things have contributed to their status including the large amount of deforestation for mining and timber and being hunted in order to protect livestock. But the biggest reason is the high demand for their fur. Although the jaguar was put on the endangered species list in the 1970's, illegal trade and poaching has been a major problem.

Articles sent to ***Animal Keepers' Forum*** will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for ***AKF***. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

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FROM THE BOARD OF DIRECTORS

Squawking, bellowing, scent marking, releasing pheromones, growling, posturing, rumbling – communication is an imperative part of animal life, and the same goes for keepers! While we stick to different means (talking, hand signs, texting, interpretive dance) the goal remains the same: satisfying a need to share information and build relationships. As the Board of Directors oversight for the Communication Team, sharing information is a big part of my day, and one I'm thrilled to do on behalf of AAZK.

My day job, Animal Programs Specialist at the Columbus Zoo and Aquarium, has me conversing with guests through presentations and with animals through training and husbandry. As an AAZK Board Member I am the direct report for the AAZK Communication Committee, AAZK Resource Committee, and National Zoo Keeper Week Program. My job is to provide guidance to these committees and programs and communicate their projects and goals to the Board of Directors. In return, I ferry directives and ideas from the Board to the committees. The people I work with are amazingly creative, productive, and driven – working tirelessly to ensure our members and organization remain well informed and well equipped.

The Communication Committee (Comm2), led by Chair James Weinpress, has a wide range of responsibilities. They schedule all online meetings used by each AAZK Committee and Program, answer questions from AAZK's e-mail accounts, create and send all e-blasts, and manage our Facebook, Twitter, YouTube, and Instagram accounts. With 14 committees and programs, three e-mail addresses, 2,000+ subscribers, 1,800 Twitter followers, and 14,000 Facebook fans, this is a HUGE job for a small group.

The AAZK Resource Committee (ARC), though only in year two of its existence, is making a huge impact on the organization. These dedicated people, led by Chair Robin Sutker and Vice-Chair Rebecca Salinas, are who you have to thank for postcard exchanges, the Chapter Marketplace and AAZK Committee and Programs Table at the National Conference, resources to develop AAZK members and Chapters, and the ever-popular animal word clouds, to name a few. This year promises to be a banner one for ARC so check your inbox and our website for brand new resources, contests, and word clouds coming soon!

The National Zoo Keeper Week (NZKW) Program, under the management of Kristen Scaglione, is under the umbrella of ARC and a huge annual happening for keepers everywhere. Starting with a resolution from the House of Representatives, this week seeks to recognize keepers for the incredible and irreplaceable work they do at facilities across the country. This year's theme, *Keeping it Together: Teamwork, Collaboration, and Support*, will highlight the importance of teamwork in our daily operations and accomplishment of larger goals. Let us know how you and your facility recognize keepers during NZKW, July 14-18! And remember; if you respect animals, love zoos and aquariums, and have conservation in your heart, #ImAKeeper applies to you.

The Communication Team is near and dear to me – we work constantly to better communicate with our members and followers, develop useful and pertinent resources to aid our membership, and promote the profession by informing others as to how awesome keepers are. Communication is, however, a two-way street. We want to hear from you – your ideas, your input, and your take on how we can make AAZK even better. Send us a message, tweet at us, or leave a scent trail – however you choose to communicate.

Hope to hear from you soon!

E Hardy Kern III

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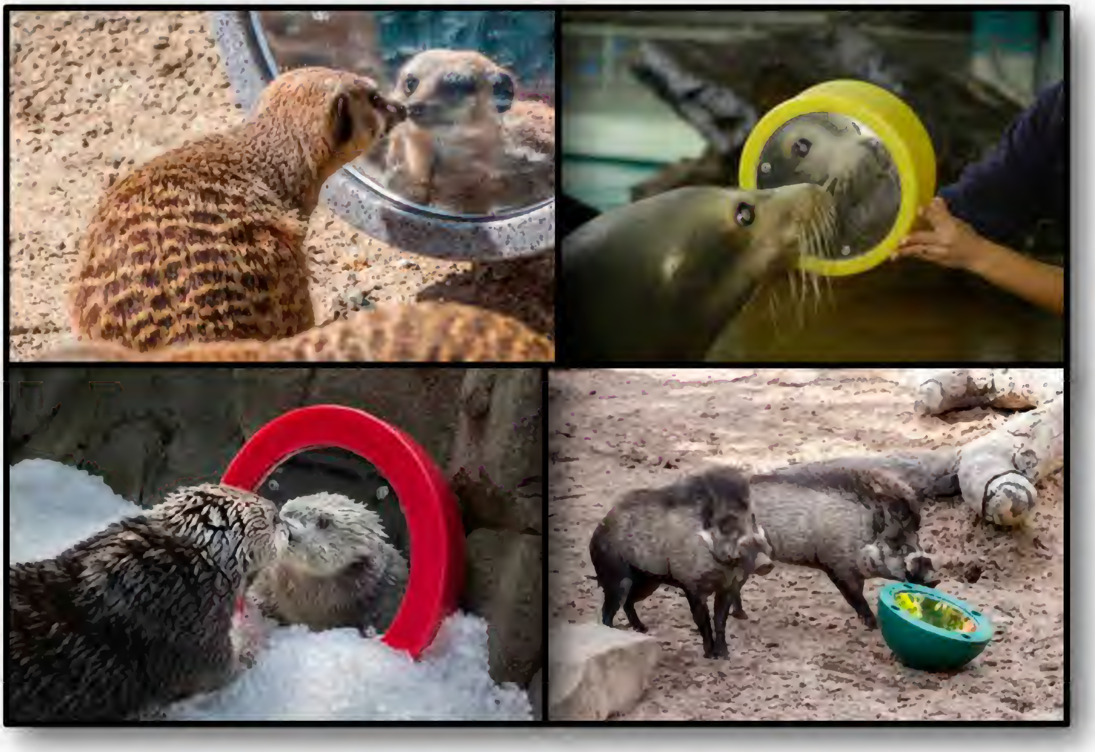

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COMING EVENTS

Post upcoming events here!
e-mail shane.good@aazk.org

May 4-6, 2018
Recon: Reconnecting with Elephants in Restricted Contact.
Colorado Springs, CO
Hosted by
Cheyenne Mountain Zoo
For more information go to:
cmzoo.org/index.php/recon-elephant-workshop/

May 7-11, 2018
Practical Zoo Nutrition Management
Front Royal, VA
Hosted by Smithsonian-Mason School of Conservation and National Zoological Park. Go to:
smconservation.gmu.edu/programs/graduate-and-professional/professional-training-courses/nutrition/

May 14-18, 2018
RAW: Regional Aquatics Workshop
Tampa, FL
Hosted by The Florida Aquarium
For more information go to:
rawconference.org/index.html

June 20-23, 2018
2018 International Herpetological Symposium (IHS)
Houston, TX
Hosted by the East Texas Herpetological Society and Houston Zoo
Go to:internationalherpetologicalsymposium.com/

August 12-15, 2018
2018 Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles
Fort Worth, TX
For more information go to:
turtlesurvival.org/conference#.WqaSnqJld-Y

August 23-25, 2018
International Symposium on Pangolin Care and Conservation
Brookfield, IL
Hosted by Chicago Zoological Society
For more information contact:
amy.roberts@czs.org

September 23-27, 2018
AZA Annual Conference
Seattle, WA
Hosted by Seattle Aquarium and Woodland Park Zoo
For more information go to:
aza.org/conferences-meetings#mym

October 14-18, 2018
International Congress on Zookeeping
Buenos Aires, Argentina
Hosted by Fundacion Temaiken and the International Congress of Zookeepers
For more information go to:
iczoo.org/congress

October 15-20, 2018
Otter Keeper Workshop
Portland, OR
Hosted by Oregon Zoo
For more information go to:
otterkeeperworkshop.org/

AMERICAN
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October 4-8, 2018
AAZK National Conference
Denver, CO

Hosted by the Rocky Mountain AAZK Chapter and Denver Zoo

rmaazk.org/2018-national-aazk-conference/

October 25-27, 2018
Waterfowl Conservation Workshop
Greenville, NC
Hosted by International Wild Waterfowl Association and Sylvan Heights Bird Park
For more information go to:
waterfowlconservation.org

PDC
Professional
Development
Committee
The American Association of Zoo Keepers

AAZK Professional Development Committee Final Call for Papers and Posters

The 45th Annual AAZK National Conference
Rocky Mountain AAZK Chapter, Denver, CO
October 4-8, 2018

Conference Theme: "Adjust your Altitude"

Final Call for Papers and Posters

The AAZK Professional Development Committee is pleased to announce the Final Call for papers and posters for the 2018 National AAZK Conference hosted by Rocky Mountain AAZK Chapter. The Host Chapter has chosen the theme "Adjust Your Altitude", which will highlight innovations in animal care, professional development, and conservation.

Deadline for Submission of Abstracts for Papers and Posters: 1 May 2018
Authors will be notified regarding acceptance by 1 June 2018.

How to Submit Your Abstract for Consideration:

- Go to the 2018 conference website
- http://aazk2018.webs.com/workshops-papers-posters
- Download the Application for either poster or paper
- Fill out completely and submit to pdc@aazk.org no later than May 1st

NOTE: If you do not use the application, your abstract will not be reviewed.

Papers

Papers should focus on the conference theme including innovative approaches in the areas of husbandry, animal welfare, conservation, education, enrichment and training.

Authors will be allowed 15 minutes for a presentation with five minutes of Q&A immediately following.

Posters

Posters will be on display throughout the Conference with a scheduled Q&A session with the author, time to be determined. Posters will be judged by members of AAZK PDC on criteria such as adherence to the conference theme, innovation, and poster layout and organization. Certificates will be awarded to winning posters at the designated Poster Session.

Easily Evaluating Success in Educational Programming

Crystal Holcombe, Collections Specialist
Arizona-Sonora Desert Museum; Project Dragonfly at Miami University
Tucson, Arizona

As keepers and educators, we hope to have a lasting effect on the public attending our programs, but often it is very difficult for us to know if this is happening. Even if our visitors are enjoying themselves, are they being affected? This paper offers an approach for determining whether visitors to an educational program are being influenced through a discussion of methods used to evaluate a live animal program at the Arizona-Sonora Desert Museum. These methods are easily enacted and require very little personnel and resources.

Introduction

Zoos, museums, and aquariums have very important mission statements, but how do staff know if an institution's mission is being fulfilled? Many studies cite the need to evaluate the effectiveness of programming (Ross and Gillespie, 2009; Luebke and Matiasek, 2013). After all, without evaluation, we cannot know that our messages are influencing our visitors, nor whether we need to make changes to improve message articulation and delivery. Unfortunately, due to a lack of resources, many organizations conclude that they cannot perform any formal evaluations, relying instead on anecdotal evidence. For example, at my facility, there had been no evaluation of the efficacy of a venomous reptile program, "Live and (sort of) on the Loose" (LOTL), which has been presented since 2004 (S. Poulin, personal communication, September 15, 2015). Presenters relied on visitors volunteering their feelings to determine the effectiveness of the presentation.

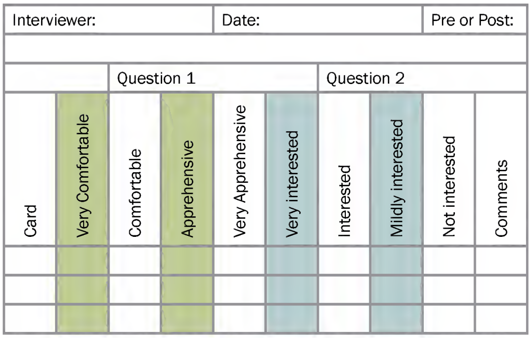
Herpetology Keeper, Russ Solsky, presenting a rattlesnake to the public.

Beyond a lack of resources, measuring whether a program in an informal environment (education outside of a school setting) is effective can be difficult because there is no test that will work for all programs and outcomes (Feder, Shouse, Lewenstein, and Bell, 2009). This paper details the methods used in one study with explanations of how to employ them in other settings. I will start with a detailed description of the methods applied and follow with a step-by-step guide for how to adapt the methods to your program.

Methods

Many institutions and their associated programs try to address one aspect of informal education's goals: changing people's ideas and creating emotional responses and connections to animals (Feder et al., 2009; Roe, McConney, and Mansfield, 2014). With this in mind, I spoke with the Curator of Living Collections who has been involved with LOTL since its beginning. I asked him what the goal of the program was when it was created. We chatted and boiled it down to one simple question, in this case, "Would attendees be more comfortable (and thus less fearful) around rattlesnakes as a result of attending the program?" (S. Poulin, personal communication, September 15, 2015). I further decided to include a question about changing interest levels as it has been shown that even fearful interest in animals can result in increased learning as visitors spend time at exhibits and programming associated with these species (Clayton and Myers, 2009). In my experience conducting surveys, it is best to limit the questions to between one and five and preferably three or less to increase the number of attendees willing to participate and to simplify the procedure for interviewers. Next, I took predictions from the curator and I created a prediction of my own so that we would have references to know whether the data would show success. If you do not do this beforehand, it is much harder to look at the numbers later to decide if they show that the program is achieving the numbers for which it is aiming.

Once the questions were chosen, a method for obtaining the data was developed. Up to two volunteers and I conducted interviews before and after the program on six separate days. Numbers of interviewers will depend on how many visitors you have and how much data you want to collect per day. My research was not conducted during our busiest season and people enter our program area at a steady pace so it was relatively easy for two to three interviewers to speak with almost everyone. The post-interviews were simple in spite of the single departure time because the visitors already knew the questions and the procedure from the pre-interview. Further, you may or may not need to conduct six days' worth of interviews. In deciding how many days to interview, consider variations in the program and in your visitors. If you have multiple presenters, you will want data that represents that. If the demographics of your visitors are variable day to day, you may



Interviewer:				Date:				Pre or Post:	
		Question 1				Question 2			
Card	Very Comfortable	Comfortable	Apprehensive	Very Apprehensive	Very interested	Interested	Mildly interested	Not interested	Comments

Figure 1. Example of data collection table. My research had two scaled answer questions. You could pre-enter the card titles if you would prefer.

also want to conduct surveys on multiple days. The timing of when to conduct the interviews is also quite variable. For my research, pre-interviews took place in the half hour before the program and post-interviews were performed as people left the program until they were complete, which usually took about twenty minutes as some people stayed longer to ask questions of presenters. Make your decision based on how the inflow and exodus of people transpire at your program.

The actual procedure was simple but thorough. The questions and possible answers (multiple choice) were printed in large text on a laminated paper. This allows people who are more visual to ponder the question. If your demographics include people speaking other languages, you could print questions in that language as well. Each interviewer had a deck of playing cards and a clipboard. The cards were for keeping track of visitors while maintaining anonymity. We handed each visitor a card, i.e. King of Diamonds. We recorded their response to the questions coded to their given card. Then after the program, we asked the same questions, then collected the card back from them, allowing us to pair their pre- and post-responses. For my research, we used only one deck of cards most days and divided its cards amongst the interviewers. If you do use multiple decks, make sure that the backs of the decks are distinctive so that you can identify the card, e.g. King of Diamonds- black deck versus blue deck. You could also use one deck and know that you will have no more than 53 responses per day (52 plus the joker card). On the clipboards, I had preprinted tables for my two questions (see Figure 1) and a questionnaire for the presenters to account for variables that might explain why some days may have statistically different results, see Figure 2. The questionnaire is present to compensate for daily variation in the program because Roe, McConney, and Mansfield (2014) noted that animal activity and presenter skills could influence attendees' receptiveness to learn. Different sheets were used for pre- and post-interviews so that interviewers did not know pre-program response while asking post-program questions. This is to prevent interviewer-influenced biases. In addition, direct, relevant comments to the interviewers were noted as qualitative data. You could have the card names preprinted on the tables. I did not because I did not know which cards would return to which interviewer, but as a result the interviewer had to quickly write the card's name as they took the responses. If you do it this way, I recommend coming up with a shorthand ahead of time, i.e. K=King, D=Diamonds.

A method for choosing whom to interview also has to be chosen ahead. I went for as random as possible by doing a convenience sample. Each interviewer approached the first program attendee or group they saw that was not already being interviewed as they entered the lobby of the theater. As soon as the interviewer finished with one group of attendees, they approached the next attendee or group to enter. Anyone who was capable of understanding the interview questions was permissible, regardless of age, gender, or any other category. A friendly reminder, you should ask permission from parents of children before interviewing them. You can decide how to determine which children are of an age that you should obtain permission, i.e. do you talk to a pair of teenagers without parents?

Once you have all of the methods figured out, you will need to train anyone who will be conducting interviews. I developed a short script (Appendix A) and printed a copy for under the questionnaire tables on the clipboard. The script included asking whether attendees would mind answering two brief questions before and again after the program. They were informed of this two-part participation requirement so they were aware of the time commitment. Each interviewer (I used volunteers) observed me conducting at least two interviews before conducting their own. In order to decrease influencing answers, interviewers were informed that there was no correct answer and they often mentioned this to attendees.

After interviews are done, data are paired to calculate changes in opinions (or whatever you measured). My questions led to scale responses so that I could numerically code them for input into a data spreadsheet. For this study, "very comfortable" was coded as four and "very apprehensive" was coded as one. Coded pre-responses were subtracted from coded post-responses, yielding positive, negative, and null results. Percentages of attendees who changed their perspectives positively or negatively were calculated. A further percentage was calculated removing those with pre-response "ceiling effects" (Stern, Powell, and Hill, 2014). In my study, an example was those that rated themselves as "very comfortable" in the pre-program interview as they could not experience an increase in comfort. If their responses indicated a loss in comfort, they were included in the decreased level percentages. An example of the data calculations can be seen in Figure 3. You will want your

Figure 2. Example of a chart to collect information on presentation. It is important to note who is presenting, the behavior of animals, and any other information that may affect the responses you get.

Date:

Presenters:

Snake: Very Calm Calm Apprehensive Very Apprehensive
Further notes about snake behavior:

Notes about presentation:

question(s) to be simple and preferably multiple choice or scale questions, though true/false or short answer are possibilities as well. Depending on the question, my method of coding could be used for other types of questions.

Here is the process, outlined step-by-step:

1. **Step One: Get approval** from the institution. This can involve many levels i.e. the program's department, upper management, education department, so make sure you don't leave any stakeholders out.

2. **Step Two: Meet with program creators** or department heads. Ask them for their program objectives.

3. **Step Three: Decide on the question(s)**. Keep them few in number and with pre-selected answer choices.

4. **Step Four: Make predictions.** Get predictions and goals from interested parties.

5. **Step Five: Gather supplies.** I would recommend: clipboards, pens, a deck or two of playing cards, laminated copies of your question(s) for all researchers, and preprinted data collection sheets (see Figures 1 and 2).

6. **Step Six: Find and train help.** In order to get as much feedback as possible, enlist volunteers to help you gather data. Make sure that they understand how to collect data and how to avoid biases.

7. **Step Seven: Set up and run evaluation.** Have interviewers in place before people enter the program area or in the waiting area if the audience waits outside the presentation area. If possible, at the end of the program, remind visitors to complete the follow-up survey. Have interviewers in place before people would exit.

8. **Step Eight: Calculate results.** Use the card names to compare starting and ending responses. Calculate percentages of individuals with a change in responses.

9. **Step Nine: Present results.** Don't forget to share results with everyone in the program department and those from whom you asked permission.

Potential Bias

With any study, potential exists for biasing the data. I would warn that "convenience samples" are not truly random because only the individuals asked and willing to participate are involved. Do your best to randomize who is asked to participate. In my study, as soon as a researcher was free, they asked the next person to walk in. We were also lucky enough to include almost everyone who attended the program.

The next common source of bias is response bias due to unintentional cueing by interviewers. Discuss this ahead with your volunteers. Depending on your question, this could be easy or difficult to avoid. In my study, one interviewer may have biased results one day by encouraging attendees to enjoy rattlesnakes during pre- and post-interviews. She did not intend to have any consequences; she just did not understand that it could sway people's choices.

Finally, there is potential for response bias from those who respond in a manner they feel interviewers want or those who feel some responses are objectionable (Piedmont, McCrae, Riemann, and Angleitner, 2000). This will be important as you write your question so that you do not lead people to responses. Try to make sure that the question(s) seems okay to answer honestly. In my study, I emphasized that whatever they felt was fine. Luckily for me, fear of snakes is so common that it did not seem that anyone was afraid to say they were apprehensive around snakes.

Limitations

A limitation of this method is that it only measures attendees' perceptions of how they feel. Further, in some circumstances, it will measure a hypothetical situation. A real world test would be better of course, but would be a much more difficult and costly method of evaluation. In my study, even a change in perception was a good step in the evaluation process.

Caution

There are always aspects of a study that you would do differently given the opportunity. Know that these will happen, just do your best to avoid them. A limitation I encountered stemmed from the terminology I chose. First, some people did not understand the term "apprehensive," requiring further explanation from the researchers. Second, the term "very comfortable" could be seen as a bad thing because it might mean that people were too comfortable with rattlesnakes after the program. I would recommend that you discuss/review your question(s) with multiple people to try to eliminate this issue.

Another caution is to account for variables. Variables will depend on your program, but could include different presenters, different animals used, and different dispositions of the animals. Have a way to keep track of these variables so that if one days' data looks considerably different, you can check it against the recorded variables. Figure 2 shows my method for tracking some variables.

Herpetology Keeper, Frankie Casalenuovo, presenting a rattlesnake to the public.

	Question 1			Question 2			
	Pre	Post	Score	Pre	Post	Score	
A D	2	3	1	4	4	0	
2 D	2	3	1	3	4	1	great program
3 D	2	3	1	3	2	-1	
4 D	4	4	0	1	2	1	more respectful, good lessons
5 D	1	1	0	2	2	0	Add gila monsters to things I'm afraid of
		Total	3		Total	1	
	Average Change		0.6	Average Change		0.2	
	Removed ceiling		0.75	Removed ceiling		0.25	

Figure 3. Example calculation of paired data. In the above example, D stands for Diamonds, the gray squares indicate ceiling effects. To the right are comments recorded by the interviewers.

Conclusion

As others and I have said, evaluation is very important in getting our messages and mission statements across to the public (Ross and Gillespie, 2009; Luebke and Matiasek, 2013). My evaluation of the program at my institution showed that we are exceeding our desired goal, which was wonderful to confirm with real data. Interestingly, it also showed areas which could use some further study as the results varied greatly due to a specific variable. By performing this quick and easy research, I was able to have evidence of the efficacy of our program, which could later be used in many settings, including grant writing, conversations with donors, and new program development. If a later study is performed, the influential variable could be studied to enhance our effectiveness even more.

I hope that by using these methods, you can evaluate your programs and perhaps even refine them, allowing you to reach the public in more and more compelling ways. If you have any questions or need clarifications about my methods, feel free to contact me at cholcombe@desertmuseum.org

Acknowledgements

I would like to thank Stephanie Poulin and the Herpetology, Ichthyology, and Invertebrate Zoology Department of the Arizona-Sonora Desert Museum for allowing me to evaluate their program. I would also like to thank Robert Holcombe, Stephen Canipe, Pam Ryan, and Jeanette Hanby for assisting me in data collection during the original study. Finally, I would like to thank Alicia Smith, Kelly Marcoux, and Julie Strom for reviewing my paper.

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Appendix A

Volunteer Interviewer Instruction Sheet- I reviewed this with them, italics are not to be said aloud.

Pre-mark on your paper that these are PRE answers

"Would you mind answering two quick questions before and after viewing this program as part of a Master's study? No identifying information will be taken."

If they ask for information about the study, direct them to the posted sign.

Give card (record)
"This will be used to correlate your before and after information. Please return it to one of the interviewers after the program."

Ask questions,
"How would you feel upon finding a rattlesnake when hiking?"
"very comfortable, comfortable, apprehensive, very apprehensive."

If they ask for clarification about where the snake is in the question or seem to be unsure how to answer, it is a three-foot snake on the path about six feet ahead of them. There is no right answer.

"Would you be interested in observing the snake?"
"very interested, interested, mildly interested, not interested."

Record answers.

Post-Mark a new paper as POST

Retrieve and mark down what card they had.

Ask questions, record answers. If they offer any comments ("I loved the program, I didn't know…") record them to the side. *Thank them for their time and participation.*

Inka: The Jaguar with 8 Lives Left.

How the staff at Elmwood Park Zoo helped our jaguar persevere and survive an ischemic stroke.

Kate Olsen, Animal Keeper
Elmwood Park Zoo
Norristown, Pennsylvania

When an animal is sedated for a medical procedure, we as animal care professionals always assume the risks that may follow. We carry the knowledge that various species, as well as individual animals, can and may have negative reactions while under anesthesia. Unfortunately, this was the case for the staff at Elmwood Park Zoo when Inka, one of our iconic jaguars *(Panthera onca)*, suffered a massive stroke during a dental procedure. In the days that followed, the entire staff at Elmwood did everything in our power to give Inka the best shot at returning to living a healthy life. The paper that follows will provide a summary of the events preceding her stroke, the recovery period, and what Inka's life is like today. The collective efforts of Elmwood Park Zoo's staff helped Inka not only survive, but thrive.

Background

Inka was born on March 22, 2013 at Woodland Park Zoo in Seattle, Washington. She joined our collection at Elmwood Park Zoo on November 23, 2014 as part of a breeding recommendation to be paired up with our male, Zean. Personality-wise Inka is extremely playful and mischievous. She is also highly motivated which makes training extra enjoyable, and she quickly learned a variety of husbandry behaviors.

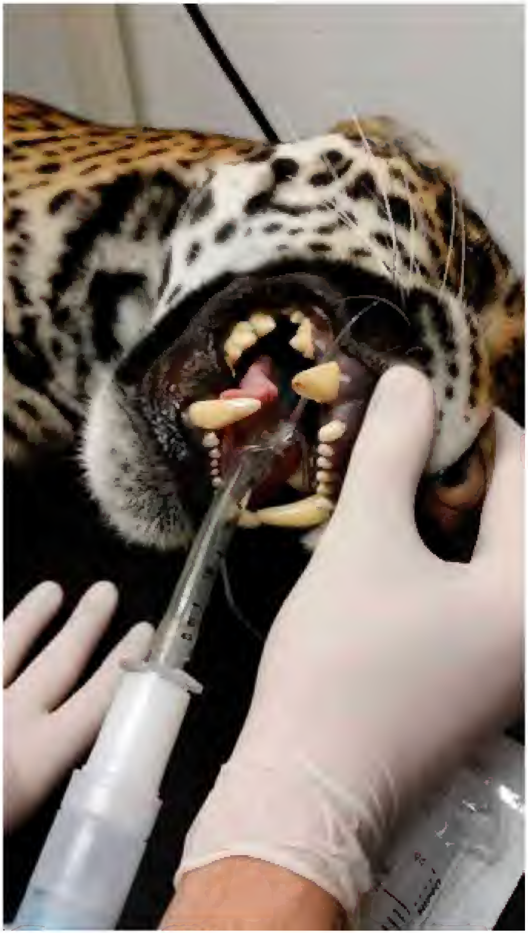
On October 12, 2015 a keeper observed Inka biting at the chain-link fence of our jaguar exhibit and noticed an abnormality with her upper right canine tooth. The keeper proceeded to call myself and our lead keeper over to investigate and take a picture of the tooth. As her trainer, I cued her to present an open mouth command in which we were able to confirm that she had broken her canine. The tooth was broken but not actively bleeding, though the pulp of the tooth was still visible. Later we were able to have our veterinarian assess the tooth and determine that we would need to schedule a dental surgery.

Almost two months later, on December 9, 2015, we began preparations for Inka's dental surgery. At approximately 9:15 am, myself and our vet tech headed into our jaguar holding to administer a sedative via voluntary injection. Within minutes, Inka was successfully sedated voluntarily and transported to our veterinary clinic.

Murphy's Law

Shortly after Inka was transported to the clinic she was put on ISO gas, and our veterinary staff began a physical assessment. During this time, the laptop with the dental x-ray program crashed. Our IT team was notified and they quickly responded in an effort to fix the equipment necessary to take the pictures vital to proceed with the surgery. While the team was attempting to reinstall the x-ray software, our veterinarians administered annual vaccines, took full body and skull x-rays, drew blood, and weighed Inka. While doing the physical assessment, the tubes connecting the ISO gas face mask to the machine began to separate. Medical tape provided us with a quick fix, but that was unfortunately not the last of our problems. At around 10:00 am our dental specialist arrived and determined that we may be able to avoid the root canal and proceed with a vital pulp therapy procedure (essentially a tooth cap). Within several minutes, our IT Team was able to successfully install the dental x-ray programming. The x-ray results further confirmed that we could proceed with the pulp therapy procedure. Our specialist began drilling the tooth at approximately 11:00 am. While in the midst of drilling the tooth, the dental drill broke. This left us scrambling to find a replacement to finish the procedure. Fortunately, one of our keepers is related to a local dentist, so were able to borrow a drill and finish the procedure at around 1:00 pm. All of these unexpected hiccups and setbacks nearly doubled our projected procedure time, but we had no true idea of how much that extra time would cost us until later. We transported Inka back to her holding and administered the reversal drug at 1:30 pm.

At around 4:00 pm, when several keepers went to check on her, Inka still appeared unresponsive. Our veterinarians were notified, and we continuously checked on her throughout the evening. At 8:00 pm Inka was still lateral, but on the opposite side that she was placed down on. She appeared to be coherent but unable to right herself, with movement only observed in her right front leg.

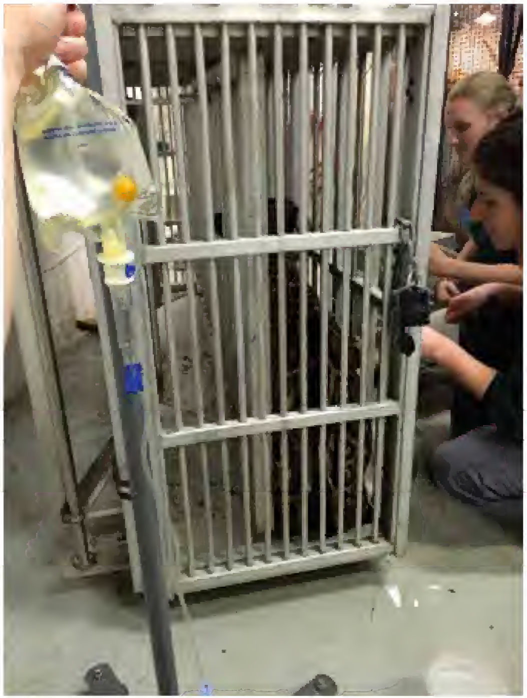


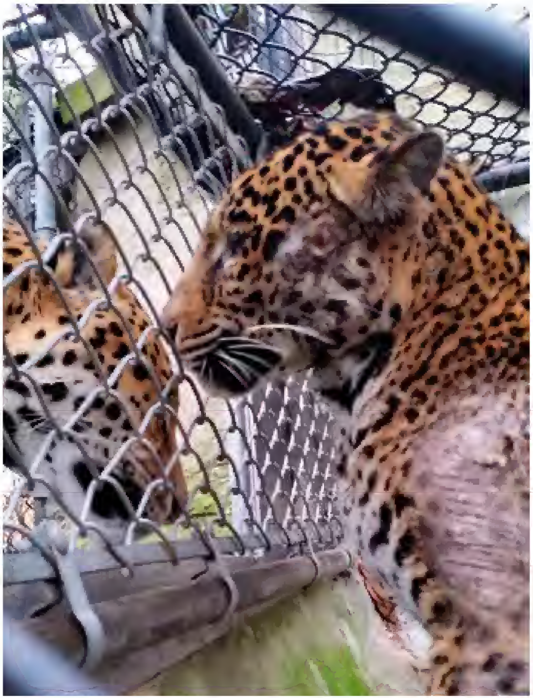
Examining Inka's broken tooth.

The Aftermath

At 7:00 am the following morning, we found Inka still lateral in her holding stall. She appeared to be coherent and sensitive to light, touch, and sound. There were smeared bowel movements on the floors and walls, which seemed to be an indication of her struggling to right herself throughout the evening. At this point our veterinarian had contacted a neurologist to evaluate her situation. When our neurologist arrived he determined that Inka had most likely suffered from a stroke or blood clot. He then coordinated with our veterinarian for more testing for the following day to further assess her condition.

On Friday December 11, our director arranged a police escort for us to transport Inka to a local emergency specialist facility about 30 miles away from our zoo. Inka was resedated via a tranquilizer


Inka in the squeeze.


Inka's reintroduction to Zean.

dart and loaded into a shipping crate. Once we arrived at the emergency center, Inka was unloaded from the shipping crate and put on ISO gas, which included having her own anesthesiologist. Since the neurologist suspected a stroke or blood clot, the first test we performed was an MRI. After about 30 minutes of scanning, our suspicions were confirmed. Inka had suffered from a large ischemic stroke in the cerebellum part of her brain. As the cerebellum deals with mobility and motor coordination, it made sense that Inka was unable to right herself after sedation. After the MRI, an ultrasound, echocardiogram, and a spinal tap were conducted in order to rule out any other possible medical issues. Fortunately, all of the other testing came back normal. Based on the MRI results, our neurologist gave Inka an 80% chance of survival, with the first week being the most critical. While we were concluding our testing at the emergency center, our curator had reached out to the animal care team at the Philadelphia Zoo in order to borrow a big cat squeeze cage in which we could allow Inka to recover in. At approximately 6:00 pm we returned to our zoo and unloaded Inka into the squeeze cage which was set up in our indoor quarantine area. She was reversed and monitored until 10:00pm, then further observed via a nest camera throughout the evening and for the duration of her recovery.

The Road to Recovery

The following morning, Saturday, December 12, Inka was still laterally positioned in the borrowed squeeze cage. In an attempt to prevent pressure sores, the keepers had to shift Inka to her opposite side at least three times a day. In order to manipulate her in the squeeze cage we used a series of ratchet straps and bamboo poles to roll her on her opposite side. This process took anywhere from 5 to 15 minutes. In addition to shifting her from side to side, we also gave her antibiotics to ward off infection, steroids to prevent inflammation, and fluids to prevent dehydration. We left her some meatballs overnight and continued to observe her from the nest camera.

Upon arrival on Sunday, we found Inka in a sternal position for the first time since her stroke. Though she didn't touch any of the food left from the day before, she seemed a lot more alert and even growled at the keepers. We noticed that Inka also seemed a lot more reactive to touch, especially in her right rear leg. Prior to shifting Inka, we attempted to tong feed her for the first time and she ate readily. Our neurologist joined us in the early afternoon and was very pleased with Inka's progress. Towards the end of the evening we observed slight movements in all four limbs. Before leaving, we squeezed Inka into a sternal position and cleaned the rear parts of her body with waterless shampoo to help prevent urine scalding. We continued to give her subcutaneous fluids as well as her medications. At the end of the night we switched Inka to her opposite side and tong fed her more meatballs. Generally speaking, Inka always showed the most progress when she was alone and didn't feel threatened in the presence of people. This is where the nest camera was absolutely crucial in tracking her advancements. At one point in the evening, Inka was observed sitting up for the

Inka and cubs on exhibit.

very first time since her stroke four days prior.

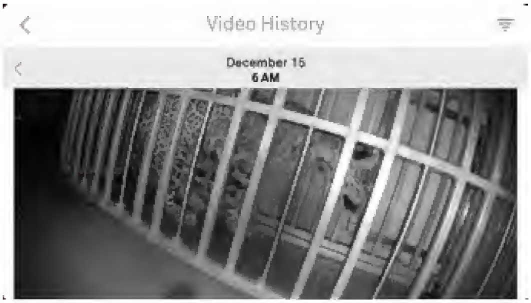
On Monday morning we found Inka laterally positioned on her left side; she tended to favor this side as she regained strength in her right limbs. We fed her about ½ pound of meat, positioned her sternally, and then gave her additional subcutaneous fluids. In the afternoon we offered her another pound of meat, to which she was able to make her own movements more towards the tongs to eat. Before we left for the day we shifted Inka from her left to her right side one final time, noting some slight urine scalding on the left side. Later that evening, through the nest camera, our curator watched Inka fully stand up in the squeeze cage.

Tuesday, December 15 proved to be the biggest day of milestones in Inka's recovery. In the early morning hours, Inka was observed attempting to walk forward in the squeeze cage. Her gait was fairly hypermetric and she overextended her front legs in order to feel her way forward. When the keepers arrived Inka was sternally positioned, so we offered her water in a shallow dish. Inka drank the water eagerly, thus allowing us to forgo future fluid administrations. We were able to easily tong feed her about three lbs of meat throughout the day in which she showed a lot more progress in her head and neck movements. Furthermore she also remained sternally positioned for the rest of day, which meant we did not need to reposition or shift her at any point. Before leaving for the evening we refilled Inka's water dish and placed it towards the end of the squeeze cage to give her more incentive to move forward. Throughout the night Inka was recorded grooming herself, moving forward, and even turning around in the squeeze for the first time.

December 16 marked the official one week period from the day Inka had her stroke. At this point in her recovery our curator felt confident that we could move Inka out of her squeeze cage and back into her holding. Inka was fairly active in the morning, with lots of tail movements and slight head tremors. We attached the big cat shipping crate to the squeeze cage and opened the door. We were able to watch Inka's movements from the nest camera, and she began to move towards the crate shortly after we left the area. To give her a little more incentive as it got closer to the evening, we put her water bowl in the back of the shipping crate. Within a few minutes we watched Inka move into the crate from the camera and we were able to shut her in and transport her to her holding. We positioned the crate against the shift door in the holding and opened the door. Amazingly, Inka was able to walk into the holding stall herself. Her gait was somewhat shaky and hypermetric, but she was able to keep her balance. We set up the nest camera in her holding to be able to continue to observe her and left for the evening.

Moving Forward

Two weeks after her stroke, Inka was consistently shifting in and out of her day yard and holding stall. Our curator decided that she had shown enough progress in her movements to be able to negotiate the terrain of our full exhibit. Inka was able to slowly navigate the rockwork exhibit, gaining more and more confidence in her abilities the more time she spent outside. After a substantial amount of time spent alone getting her bearings, we felt comfortable enough to allow her to interact with Zean through a fence that divided the exhibit. To our relief, both Zean and Inka greeted each other peacefully, and absolutely no aggression or stress was observed throughout the day. The following week made way for more improvements in Inka's mobility. She was able to make jumps a little under three feet in height and she was moving much more quickly on exhibit. One week later, exactly one month from the day she had her stroke, Inka made a four foot jump onto a platform in her holding stall for the first time. At this point in time both keeper staff and veterinarians considered Inka about 95% back to normal. Her fur had almost completely grown back in the spots where she had scrapes or urine scalding. Sometimes an occasional head tremor or hypermetric gait was observed, but they were very inconsistent. Usually the head tremors would be noted if it seemed like Inka was concentrating on something, like stalking keepers or wild birds. Her husbandry routine resumed as it had prior to her stroke, with no modifications in her daily care. Moving forward we began to discuss Inka's future and her role in



Inka on nestcam.

the breeding recommendation to potentially mate with Zean. After tracking her heat cycles for multiple months, the animal care team prepared to do our first full contact introduction with Inka and Zean. On October 12, 2016, one full year to the day that Inka had initially broken her tooth, we introduced her and Zean for the first time during one of Inka's heat cycles. In what was nothing short of a monumental jaguar introduction, both Inka and Zean hit it off right away and didn't show the slightest hint of aggression towards each other. For the next three days and total of 24 hours, Inka and Zean shared an exhibit and some breeding behaviors were observed but not necessarily any successful copulations. After three days it was clear that Inka was no longer receptive to Zean's advances so they were separated and exhibited alone. Although it was very unlikely that a couple of first time breeders (one of which with a traumatic brain injury), would be able to figure it out on the first time, they were in fact successful. On January 24, 2017, Elmwood Park Zoo welcomed "Diego" and "Luna" into our collection. With Inka's previous medical history and lack of experience, there were certainly concerns that she would have difficulty rearing her cubs. Fortunately for us, none of the aforementioned seemed to matter at all because Inka proved to be an exceptional mother. One week after they were born we were finally able to separate Inka from the cubs and they were given a clean bill of health from our veterinary staff. Under Inka's watchful eye and constant care, both Diego and Luna continue to grow and flourish.

> **When given the opportunity, and the right level of care, all animals have the potential to bounce back from a truly traumatic situation.**

Conclusion

If there is anything to be learned from Inka's story, it is how incredibly resilient animals can be. When given the opportunity, and the right level of care, all animals have the potential to bounce back from a truly traumatic situation. Inka's training program today has allowed us to do her full annual exam (including blood pressure, heart-rate, injections, blood draws, and temperature) through the fence with no sedation necessary. Since the stroke, we have sedated Inka just once to move her from her older exhibit to our new jaguar facility, after which she recovered within minutes. Inka and her cubs can be seen on exhibit daily at Elmwood Park Zoo, where most unassuming guests may never know how close we came to losing her and how incredibly she recovered with the help of our animal care team.

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Building a Science-based Behavioral Husbandry Program

(Introduction to the Science of Behavioral Husbandry Series)

Christina Alligood, Michelle Skurski, and Angela Miller
Disney's Animal Kingdom®
Lake Buena Vista, Florida

The Disney's Animal Kingdom Behavioral Husbandry program began almost 20 years ago and has grown and developed in many ways since that time. When the program first began, our staff development focus was on understanding the benefits of training and enrichment, and on making behavioral husbandry an integral part of animal care. Two decades later, the animal care industry has progressed tremendously and behavioral husbandry has become an area of focus at many zoos and aquariums. Our seasoned animal care staff have embraced our program philosophy of the integration of behavioral husbandry into animal care, and even new staff typically arrive with an appreciation of the benefits of training and enrichment. Our focus has shifted from *why* training and enrichment are important to *how* they should be implemented.

As the growth of the program continues, our aim is to build an environment of sustained progress and learning so that we are always applying the best available techniques to enhance the welfare of the animals in our care. To that end, a few years ago we began a close partnership between scientists and behavioral husbandry managers with the goal of integrating scientific best practices into our training and enrichment programs. Through this partnership we have embarked on a journey that has led us to re-imagine every aspect of our behavioral husbandry program, from philosophy to staff training to the details of planning, implementing, and evaluating training and enrichment. We are still on that journey, and the Science of Behavioral Husbandry series is our effort to share what we are learning, and how we are putting it into practice, with the animal care community. In this introduction, we tell the story of how we started down this path, share some of the things we have learned, and detail some of the resulting changes we have made.

How did we get here?

Over the past few decades, zoos and aquariums have become increasingly invested in the use of animal training and enrichment techniques to facilitate husbandry and medical care. These techniques stem from the science of operant learning, also called behavior analysis. This is the area of science that studies the relationship between the environment (sights, sounds, smells, etc.) and an individual's behavior. Using what we know about the relationship between the environment and an individual's behavior to change behavior that is significant for that individual is called applied behavior analysis. Keller Breland, Marian Breland Bailey, and Bob Bailey, early pioneers in the animal training industry, studied operant learning with the father of behavior analysis, B.F. Skinner, and then applied what they learned in the training of over 150 different species of animals. These early pioneers had great success with their company, Animal Behavior Enterprises, and were influential in the adoption of animal training techniques by zoos and aquariums. Over the ensuing years, animal training in these settings has lost some of its connections to the original scientific foundation. Some training techniques have developed and evolved in the absence of scientific evidence. Technical terms have been used inconsistently and sometimes replaced by jargon.

Restoring these connections is important to the future of behavioral husbandry. Behavior analysis has been successfully applied in many other areas, including education, workplace safety, and business management. In these areas, practitioners (those who apply science to change behavior) use recent research findings to develop new ways of changing behavior, and measure the success of those efforts using methods specifically designed for individual behavior. This process is called evidence-based practice. Scientists with expertise in operant behavior can offer practical recommendations based on current findings, which are built on a foundation of over 80 years of research. To continue making new discoveries, scientists need to understand the challenges that arise when managing behavior in practical settings. In order for this collaborative process to be effective, scientists and practitioners need to be connected to each other in ways that facilitate frequent and fruitful exchanges.

Science is ever-changing. The scientific literature, consisting of peer-reviewed journal articles and books, builds upon itself over time as new discoveries and advances are made, questions are answered, and new questions arise. We hope to foster state-of-the-art behavioral husbandry practices by maintaining a close connection with advances in behavioral science. We are doing this by integrating science-based practices into our program at all levels, including training, enrichment, behavioral assessment, and animal care problem-solving. We have a behavior analyst on our team who brings a background in basic (laboratory) and applied (practical) operant learning, expertise in translating scientific principles of behavior to practical

Taveta Golden Weaver Nest

applications, and ongoing contact with advances in the field of behavior analysis. The behavioral husbandry professionals on our team bring a background in hands-on animal training and enrichment with a variety of species, expertise in coaching and collaborating with animal care staff, and ongoing contact with advances in the field of animal care. Having a behavior analyst on our team allows us to blend this area of expertise with the strengths of our behavioral husbandry professionals.

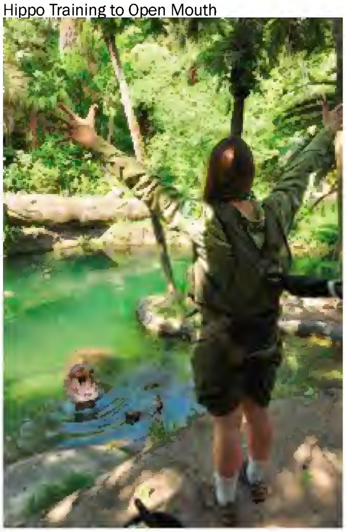
Cairo Spiny Mouse Training

What have we learned?

We have learned that the science of operant learning, also called behavior analysis, has a lot to offer us. This area of science is focused on understanding and influencing the behavior of individuals. This is a perfect match with behavioral husbandry because our focus is on the welfare of individual animals.

We have learned that the words we use when we talk about training and enrichment are important.

Because professionals in our industry sometimes use behavioral terms in different ways, our communications with each other are not always as clear as they could be. To get the best outcomes in our programs, we need to be able to clearly understand each other. As a starting point, we collaborated with Ken Ramirez and members of AZA and AAZK to update the AZA/AAZK training terms list. The updated version is on the AAZK website at https://www.aazk.org/wp-content/uploads/AZA-AAZK-Training-Terms-2016.pdf.

Hippo Training to Open Mouth


We have learned that we have some work to do in strengthening our understanding of behavior principles.

Some of the techniques commonly used and talked about in our industry have drifted away from their scientific foundations and are often used in inconsistent ways. We have begun a process of looking closely at the techniques that we commonly use and the issues we commonly face, going back to their scientific foundations and re-examining our practices. This allows us to build our capacity for carefully selecting the right tools for each situation, and using those tools consistently.

What have we changed?

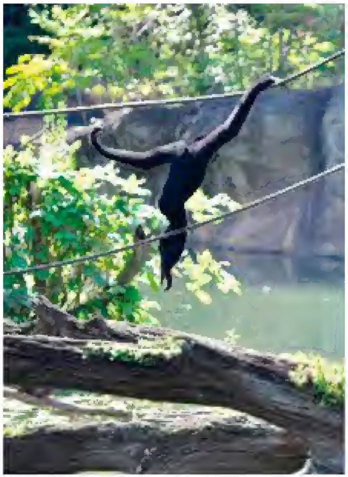
We have recently updated our program to reflect our focus on science-based behavioral husbandry. Here are some of the elements that define our new program direction. You can find this and other information at www.animaltraining.org and www.animalenrichment.org.

Behavioral Husbandry Definition: Behavioral husbandry is the component of daily animal care focused on how animals interact with their physical and social environment. Goals of behavioral husbandry include voluntary participation in their care and opportunities to express species-typical behaviors. We cultivate these goals through an understanding of natural and individual history and an application of behavioral science. We continually evaluate the success of our efforts by measuring behavior change.

Behavioral Husbandry Philosophy: The cornerstone of our program is its philosophy. We are committed to providing the highest level of animal care and guest experiences by engaging cast to build a culture of progressive animal training and enrichment. Animal, cast, and guest safety are always top considerations in the development and implementation of all training and enrichment initiatives. The behavioral husbandry programs are fully integrated into daily animal management and are both proactive and dynamic in nature. Animal keepers, managers, veterinarians, nutritionists, and scientists all contribute to the success of the behavioral husbandry programs.

Mission: We build capacity for successful application of behavior-change strategies by our animal care partners through internal education and development. We collaboratively facilitate achievement of behavioral goals through multiple partnerships. We share what we learn with our colleagues in the zoological industry through professional service and dissemination.

Marabou Guest Interaction Training



White-Cheeked Gibbon Brachiating

As we have worked to execute our vision of science-based behavioral husbandry, we have encountered many examples of the need for reconnection with scientific evidence. We have worked on these topics one by one with our animal care staff, and we will be sharing them with you in future installments of this series. Topics include variable schedules of reinforcement, conditioned reinforcers, labeling behavior, timeouts, and jackpots. We look forward to giving you a window into our journey as we continue to learn together.

Meerkat Training

Kenya Sand Boa Grass Flat Enrichment

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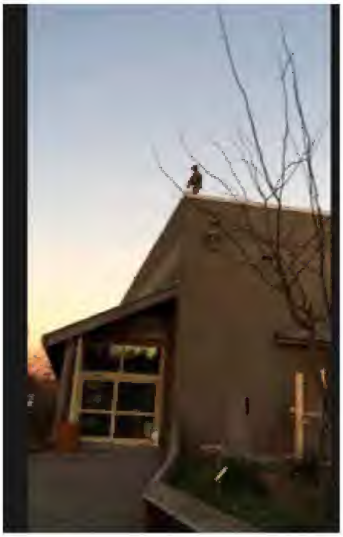
Live Action Emergency Training for Zoo Staff and Law Enforcement

James Weinpress

Today, the modern zoo and aquarium goes far beyond providing the opportunity to observe animals up close. In addition to being conservation organizations, they are cultural institutions offering an array of programs and opportunities to their guests, including a multitude of family-friendly events and educational classes for people of all ages. Many zoos and aquariums even act as large event venues hosting professional conferences or private weddings and parties. Due to the popularity of these institutions, maintaining safety procedures for guests, staff, and animals has always played a significant role in day-to-day responsibilities. Sadly though, in recent times, establishments that attract considerable crowds of people have been targeted in acts of senseless violence.

Creating safety protocols, and carrying out drills in case of an emergency, must be built into the framework of Association of Zoos and Aquariums' accredited zoological institutions across the country. Each facility may have a different method of training staff to react to these incidents, and there are several variables to consider in procedural planning. These will include the type of facility (zoo or aquarium), topographical lay-out of the institution, and number of employees. For the last two years, Monroe County's Seneca Park Zoo in Rochester, New York has had the unique opportunity to conduct very hands on training with the Sheriff's SWAT team, bomb squad, and this year, with the City SWAT team in live action emergency scenarios.

"Sniper" on top of elephant barn.
Photo by Garret Caulkins



Law enforcement moving through the zoo's Africa exhibit. *Photo by Garret Caulkins*.

All Seneca Park Zoo employees, from animal care to office staff, meet to discuss the goals and procedures for the day's training drills.
Photo by David Hamilton

This type of hands-on training is truly beneficial for all those involved. The planning and implementation of these drills adds a degree of realism that goes well beyond what a traditional roundtable discussion can offer.

Since 2016, Seneca Park Zoo remains closed to the public for an entire day to meet with law enforcement agencies and carry out several different crisis scenarios. These have proven to be valuable training opportunities for both zoo staff and emergency responders. The day begins with a meeting at the entrance of zoo grounds where all those involved are briefed with the purpose and layout of the drills. Once all instructions have been passed on, zoo staff is asked to return to their designated areas and behave as they would if it were a typical work day.

From this point, the training goes live, and a zoo employee may come across a number of scenarios to which he or she must react. This has included actors portraying masked individuals carrying weapons and/or explosives, to guests who have been shot (wound makeup and fake blood included). Staff have also found suspicious bags left unattended and animal rights extremists making violent threats to the safety of guests and animals.

Once the radio calls go out communicating the nature of the situation, the staff must react appropriately depending on the scenario. Without jeopardizing their own safety, staff gathers any injured or uninjured guests and finds the safest concealed area nearby or evacuates zoo grounds to designated emergency meeting spots. Law enforcement is notified via a command post and enters the zoo as they would in a real-life scenario.

Despite being briefed on what to expect during the drills, one cannot help but feel a high level of authenticity when a team of heavily armed SWAT members in night vision goggles commands you to get on your knees with your hands up while they secure the surroundings. Zoo staff inform law enforcement of their condition and what they know about the situation and are then escorted to safety. Once the threat has been neutralized, the drill is called as complete and all participants meet again to discuss the details of scenario and what can be learned from it. Considering the unique layout of the zoo, law enforcement agencies consider this to be just as much training for their teams in their ability to effectively respond to threats towards public safety.

This type of hands-on training is truly beneficial for all those involved. The planning and implementation of these drills adds a degree of realism that goes well beyond what a traditional roundtable discussion can offer. Each year these drills are carried out, zoo staff and law enforcement gain invaluable knowledge and experience of potential emergency situations. As animal care professionals, our job descriptions encompass a wide range of responsibilities, and this includes the appropriate responses to crisis scenarios that will hopefully never occur.

In Memoriam

ROZ SEALY

Roz was a "Zookeeper's Keeper"....she was one of the best. I met Roz when she was a volunteer, and later worked with her, as a Keeper, in the Australasian Unit at Woodland Park Zoo. She was willing to do whatever needed to be done and never shied away from a task no matter how gross it was.

When we were doing fecal assays on the Zoo's Matschie's tree kangaroo collection, Roz was diligent in helping out. Whether it was collecting, cataloging or preparing samples for assays, she was always there to lend a hand. Many times she'd come over to Australasia after finishing work in another area of the zoo to prepare samples for shipment to the lab where they were assayed. The results of that research gave us the first documented estrous cycle for Matschie's tree kangaroos and enabled us to more closely monitor their reproduction cycle.

In fact, because we were able to introduce tree kangaroo pairs at the optimal time for conception, and then determine the expected date of birth, Roz saved a joey that did not make it into the pouch. She had been observing the exhibit from the public area and realized that when the joey was born it had not crawled up into the pouch, but fell to the ground. She went into the exhibit, retrieved the joey and held it in the warmth of her hand, while she called for help to put the joey in the mother's pouch. Now you might wonder why that's such a big deal.... well it really was. That joey survived and went on to be one of the most prolific female Matschie's tree kangaroos in North America. One person, Roz....made a tremendous difference on the day she saved that joey.

The joey Roz saved was named Kiama who would go on to have five joeys plus great, great-grand and great, great-grand joeys. Over the years, four generations for a total of 25 Matschie's tree kangaroos were born because she saved one.

One of the things I'll always remember about Roz was her perseverance. I was present one day when a Senior Keeper spouted out that Roz would never make it as a Keeper. Oh, how wrong that person was! Roz was a Keeper long after that Senior Keeper had left the Zoo.

Rest in Peace, Roz......it was so hard to learn of your passing. The animals you cared for and the zoo world have lost a true friend and advocate.

— Judie Steenberg (retired Woodland Park Zoo Keeper)

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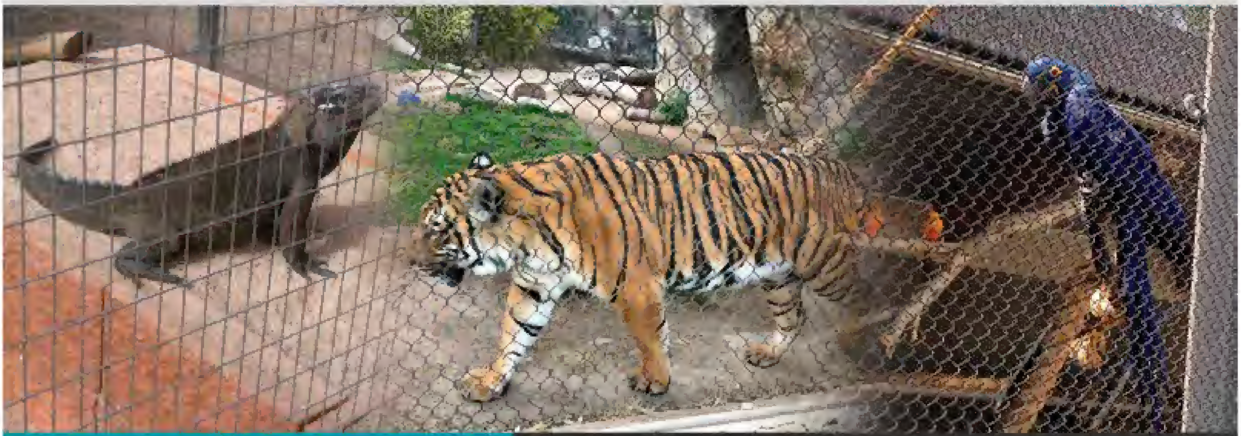

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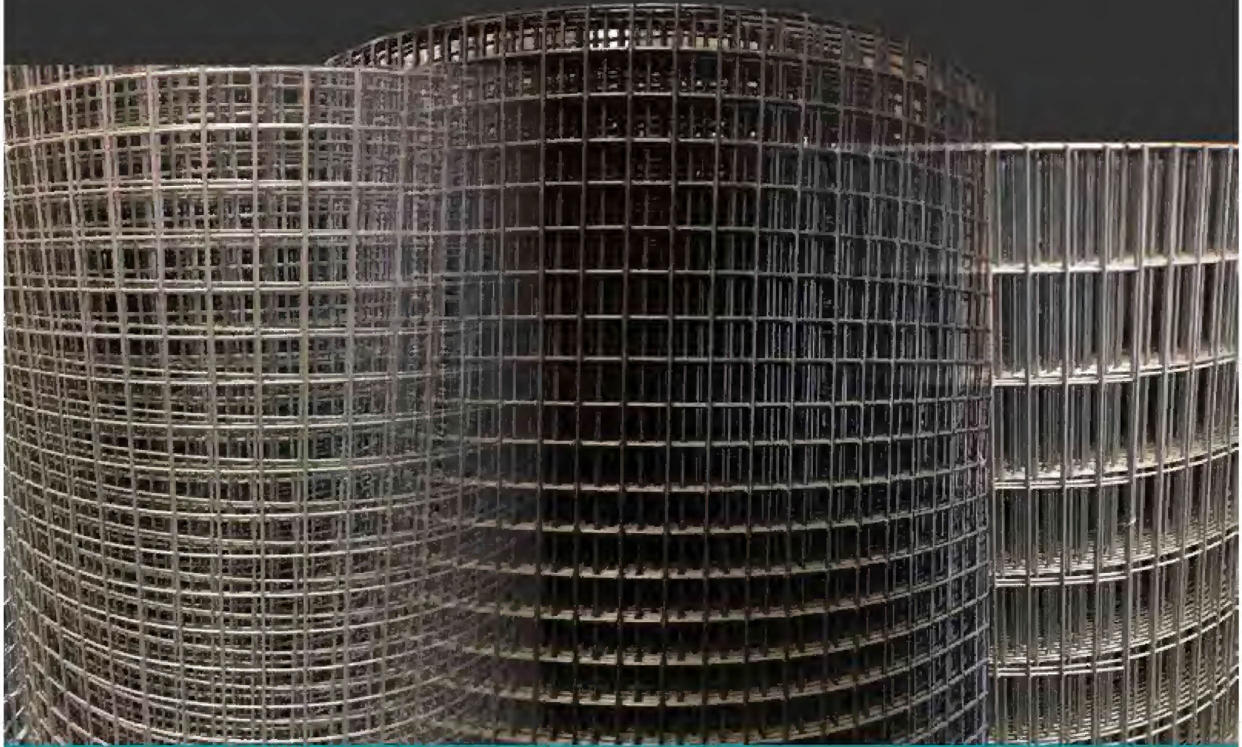

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ProCare CCU 48: 52 ¼ W x 33 H x 25 D P/N 912-140

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